REMARKS

Claims 1-7 are currently pending in the application.

Reasons for Entry of Amendment After Final Rejection

Applicants respectfully submit that: (1) no new matter has been added to the application by the amendment; (2) the amendment resolves all issues raised by the Examiner in the second Office Action; (3) the subject matter of the amendment already has been included in the Examiner's search and therefore does not require the Examiner to perform further searching; (4) the amendment places the application in condition for allowance or in better condition for appeal; and (5) the amendment does not result in a net addition of claims to the application (claims 8-14 have been cancelled). Consequently, Applicants respectfully request that the Amendment After Final Rejection be entered in accordance with 37 C.F.R. §116 and MPEP 714.13.

Claim Rejections - 35 U.S.C. § 103 – Claims 1-3, 6-10 and 13-14

The Examiner has rejected claims 1-3, 6-10 and 13-14 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,660,473 (Noma *et al.*, hereinafter "Noma") in view of U.S. Patent No. 4,516,106 (Nolting *et al.*, hereinafter "Nolting"). The Examiner contends that Noma discloses the basic claimed temperature sensor, with the exception that Noma fails to disclose a temperature measuring element being arranged on a circuit board such that the measuring element is arranged in a tip region of the protective tube on one end of a longitudinally extending circuit board and connected via strip conductors to a plug arrangement positioned on an opposite end of the circuit board.

The Examiner contends that Nolting discloses a temperature sensing element connected via conductive wires to enlarged conductive surfaces/contact pads on one end of a longitudinally extending circuit board, wherein the enlarged conductive surfaces/contact pads are connected via strip conductors to a plug arrangement positioned on an opposite end of the circuit board. The Examiner argues that the "temperature sensing element, in a broad sense, is considered to be a surface mountable component, since it is capable of being mounted on a surface." The Examiner concludes that it would have been obvious to one of ordinary skill in the

art to replace the temperature sensor of Noma with the temperature sensing element of Nolting to provide electrical insulation to the conductor strips as well as good supporting capability under a high temperature environment. Applicants respectfully traverse this rejection.

Claim 1 recites, *inter alia*:

> the measuring element (1') is **a surface-mountable component (SMD)** which is arranged in a tip region of the protective tube (11) and connected to contact pads (45, 46) on one end of a longitudinally extending circuit board (2)

Claim 1 recites a surface-mountable electronic component, known in the vernacular of those skilled in the art of electronics manufacturing as an "SMD". An "SMD" is equivalent to an "SMC" or Surface Mount Component, and is defined to be "a leaded or leadless device (part) that is capable of being attached to a printed board by surface mounting." "Surface mounting" is defined to be "the electrical connection of components to the surface of a conductive pattern that does not utilize component holes". See the attached copies of the title page and page 3 of the document "Sectional Requirements for Standard Surface Mount Technology Component Mounting", IPC Document 7073, August 2000. (Note, IPC is a global trade association serving the printed circuit board and electronics assembly industries, and whose activities include development of industry standards.)

The distinction between a Surface Mountable Device and a through hole mounted device is illustrated by a comparison of the "Type 1A", simple through hole mounting arrangement, and the "Type 1B", simple one side surface mount arrangement, both illustrated on page 18 of IPC Document 7071, August 2000, "General Requirements for Component Mounting". Copies of the title page and page 18 of this document are attached. Thus, to those of ordinary skill in the art of electronic component manufacturing and assembly techniques, the term "SMD" denotes connection of components to a surface without the use of component holes. Should the Examiner deem it necessary to amend the specification to incorporate these documents by reference or to explicitly state the characteristics of a SMD outlined above, as would be understood by the ordinary artisan, the Applicants would be willing to make such an amendment to the specification.

As admitted by the Examiner, Noma fails to disclose each and every feature of the present invention. Noma fails to disclose at least a temperature measuring component which is a SMD component and contact pads in contact with the SMD temperature measuring component. Noma discloses a thermal sensor comprising two thermistors used to detect temperature of cooling water in an engine. Noma incorporates into a single housing a first thermistor 9 used as part of an electrical circuit providing an electrical signal to an Engine Control Unit (ECU) and a second thermistor 12 used as part of a second electrical circuit providing an electrical signal to a temperature gauge. The thermistors 9 and 12 of Noma are not disclosed to be elements which are mountable to a circuit board. Accordingly, there is no objective teaching in Noma that would enable one of ordinary skill in the art to modify the invention of Noma in a manner that would render the present invention obvious under 35 U.S.C. § 103(a).

Nolting fails to disclose each and every feature of the present invention. Nolting fails to disclose at least a SMD temperature measurement component mounted to a circuit board without the use of component holes. Nolting discloses a temperature sensing module 2 (first embodiment), 22 (second embodiment) having a temperature sensing element 3, 23 extending from a supporting structure 7, 27 (preferably having electrical and thermal insulating properties). The temperature sensing element 3, 23 is connected to conductive areas 8, 28 by connecting wires 4,5; 24, 25. The conductive areas 8, 28 are in turn connected to terminal conductive areas or contact surfaces 11, 31 by conductive strips 9, 29. The temperature sensing module 2, 22 is intended for use in a an air duct of a heating or air-conditioning unit of a motor vehicle (Column 1, lines 9-11).

An objective of the invention of Nolting is to thermally isolate the temperature sensing element 3, 23 from any supporting structure (Column 1, lines 29-47). This objective is accomplished not only by physically separating the temperature sensing element 3, 23 from the supporting plate 7, 27 (the two being connected only by the connecting wires 4,5; 24, 25), but also by forming the conductive strips 9, 29 in a "meandering-like configuration" (Column 1, lines 40 and 41). By increasing the degree of thermal isolation of the temperature sensing element 3, 23 from other thermal masses, the response rate and transient accuracy of the temperature sensing module is thus also increased. Nolting fails not only to disclose a SMD type

temperature measuring element mounted to a circuit board without the use of holes (note in Fig. 2 that the connectors 24 and 25 extend through the plate 27), but indeed fails to disclose a temperature sensing element mounted directly to any surface whatsoever (disclosing rather temperature sensing elements 3, 23 connected to supporting structure indirectly by connecting wires 4,5; 24, 25).

The Examiner has argued that "[s]aid temperature sensing element, in a broad sense, is considered to be a surface mountable component, since it is capable of being mounted on a surface.". On the contrary, Applicants respectfully submit that the artisan would recognize that mounting the temperature sensing elements 3, 23 directly on a surface would in fact defeat the primary objective of the invention of Nolting, that of thermally isolating the temperature sensing element 3, 23 from other thermal masses. Accordingly, there is no objective teaching in Nolting that would enable one of ordinary skill in the art to modify the invention of Nolting in a manner that would render the present invention obvious under 35 U.S.C. § 103(a).

In establishing a *prima facie* case of obviousness, the Examiner must show, *inter alia*, that the prior art references teach or suggest all of the claim limitations. See M.P.E.P. § 2142. Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a). The proposed combination of Noma and Nolting fails to teach, disclose or suggest at least the element of a SMD temperature measuring element. As the combination of references fails to teach or suggest all of the elements of claim 1 of the Applicants' invention, it is respectfully submitted that a *prima facie* case for obviousness has not been established with respect to claim 1 or with respect to claims 2, 3, 6 and 7 which depend directly or indirectly from claim 1. The rejection of claims 8-10 and 13-14 is moot in view of cancellation of these claims. Accordingly, Applicants respectively request that the rejection of claims 1-3, and 6-7 under 35 U.S.C. § 103(a) be withdrawn.

Claim Rejections - 35 U.S.C. § 103 – Claims 4 and 11

The Examiner has rejected claims 4 and 11 under 35 U.S.C. § 103(a) as being unpatentable over Noma in view of Nolting in further view of U.S. Patent No. 5,697,706 (Ciaravino *et al.*, hereinafter "Ciaravino"). The Examiner contends that the combination of

Noma and Nolting discloses a sensor as claimed, with the exception of failing to disclose a connection piece secured against turning relative to a screw sheath by locking beads and / or recesses. The Examiner further contends that Ciaravino teaches use of recesses in combination with bead/tabs to prevent rotation of a measuring element with respect to a probe housing. Applicants respectfully traverse this rejection.

As discussed above, the proposed combination of Noma and Nolting fails to teach, disclose or suggest each and every element of claim 1. Ciaravino similarly fails to teach, disclose or suggest at least the element of a SMD temperature measurement element. Ciaravino discloses a temperature probe having a plurality of separate thermocouples arranged in a probe tip to allow heat gradients to be determined. More specifically, Ciaravino discloses conventional thermocouples 100 in contact with rings 92. As the proposed combination of references fails to teach, disclose or suggest all of the elements of claim 1 of the Applicants' invention, it is respectfully submitted that a *prima facie* case for obviousness has not been established with respect to claim 4 which depends directly from claim 1. Claim 11 has been cancelled, rendering rejection of claim 11 moot. Accordingly, Applicants respectively request that the rejection of claim 4 under 35 U.S.C. § 103(a) be withdrawn.

Claim Rejections - 35 U.S.C. § 103 – Claims 5 and 12

The Examiner has rejected claims 5 and 12 under 35 U.S.C. § 103(a) as being unpatentable over Noma in view of Nolting in further view of U.S. Patent No. 6,297,723 B1 (Shoji *et al.*, hereinafter "Shoji"). The Examiner contends that the combination of Noma and Nolting discloses a sensor as claimed, with the exception of failing to disclose the temperature measuring element being immersed in a heat conducting paste. The Examiner further contends that Shoji teaches that it is well known in the art to secure a temperature sensing element mounted with a sheath embedded in a heat conducting paste. Applicants respectfully traverse this rejection.

As discussed above, the proposed combination of Noma and Nolting fails to teach, disclose or suggest each and every element of claim 1. Shoji similarly fails to teach, disclose or suggest at least the element of a SMD temperature measurement element. Shoji

discloses a thin-film temperature detecting element 3 (embodiments 1 and 2) or 23 (embodiments 3 and 4) formed by a CVD (chemical vapor deposition) method (Column 3, lines 2-4, Column 5, lines 38-40). The thin-film temperature detecting element 3, 23 is electrically connected to the remainder of the thermal sensor by thin film electrodes 4 (Column 3, lines 6-10, Column 5, lines 46-50). The temperature measurement detecting element of Shoji is thus an entirely different device mounted to supporting structure and electrically connected to the other electrical components in an entirely different manner from the SMD temperature measurement component and associated electrodes of the present invention. As the proposed combination of references fails to teach, disclose or suggest all of the elements of claim 1 of the Applicants' invention, it is respectfully submitted that a *prima facie* case for obviousness has not been established with respect to claim 5 which depends directly from claim 1. Claim 12 has been cancelled, rendering rejection of claim 12 moot. Accordingly, Applicants respectively request that the rejection of claim 5 under 35 U.S.C. § 103(a) be withdrawn.

CONCLUSION

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 1-7, is in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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12/1/03
(Date)

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WWS:KBG:cbf
Enclosures: 1. Sectional Requirements for Standard Surface Mount Technology Component Mounting, and
2. General Requirements for Component Mounting

IPC-7073
August 2000

SECTIONAL REQUIREMENTS FOR STANDARD SURFACE MOUNT TECHNOLOGY COMPONENT MOUNTING

Component Mounting SMT/PTH Guidelines (IPC-CM-770) Task Group, (5-21a)

Proposal

Published by IPC
2215 Sanders Road
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Gull Wing Leads An SMT lead form. Leads extending horizontally from the component body centerline, bent downward immediately past the body and then bent outward just below the bottom of the body, thus forming the shape of a gull's wing.

J-Lead The preferred surface mount lead form used on PLCC's, so named because the lead departs the package body near its Z axis centerline, is formed down then rolled under the package. Leads so formed are shaped like the letter "J."

Land A portion of a conductive pattern usually, but not exclusively, used for the connection and/or attachment of components.

Land Pattern A combination of lands that is used for the mounting, interconnection and testing of a particular component.

Leadless Chip Carrier A chip carrier whose external connections consist of leads that are around and down the side of the package. (See also "Leadless Chip Carrier.")

Leadless Device see Die and Leadless Surface Mount Component .

Leadless Surface Mount Component A surface-mount component whose external connections consist of metallized terminations that are integral part of the component body. (See also "Leaded Surface-Mount Component.")

Mixed Component Mounting Technology A component mounting technology that uses both through-hole and surface- mounting technologies on the same packaging and interconneting structure.

Rectangular Lead A lead form or leg shape whose cross

Surface Mounting The electrical connection of components to the surface of a conductive pattern that does not utilize component holes.

Surface Mount Component A leaded or leadless device (part) that is capable of being attached to a printed board by surface mounting.

Surface Mount Device See "Surface Mount Component (SMC)".

SOIC Small-Outline Integrated Circuit

TLCC

SOT

2. APPLICABLE DOCUMENTS

2.1 Institute for Interconnecting and Packaging Electronic Circuits (IPC)

IPC-G-403 (Technology Reference for Throughhole and Surface Mounting)
IPC-A-600E (Acceptability of Printed Boards)
IPC-A-610B (Acceptability of Electronic Assemblies)
IPC-TA-722 (Technology Assessment Handbook on Soldering)
IPC-7071 General Requirements for Component Mounting
IPC-7711 Rework of Electronic Assemblies
IPC-7721 Repair and Modification of Printed Boards and Electronic Assemblies

IPC-7071
August 2000

General Requirements for Component Mounting

Component Mounting SMT/PTH Guidelines (IPC-CM-770) Task Group, (5-21a)

Proposal

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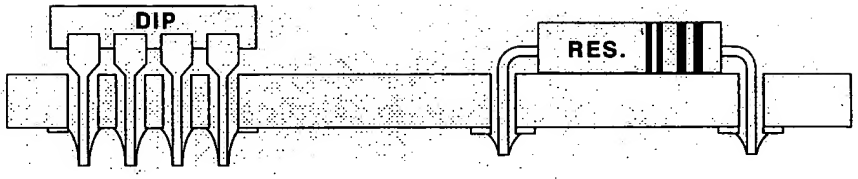
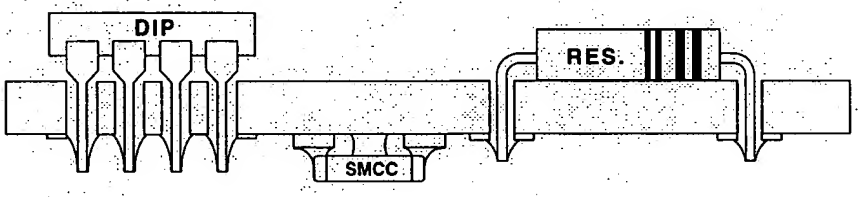
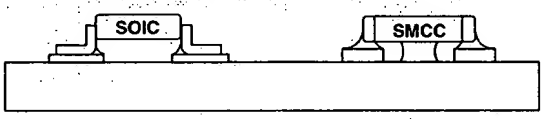


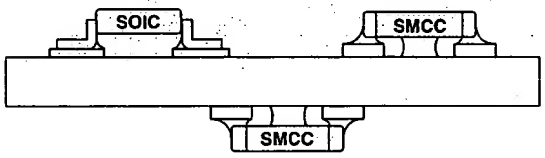
Type 1A Simple Through-Hole



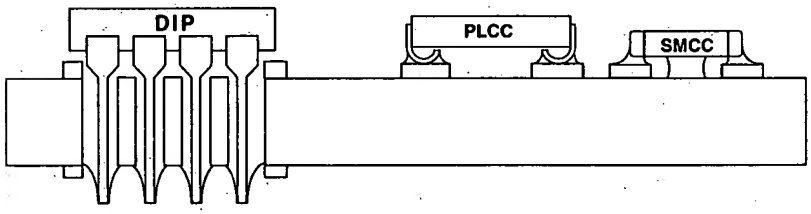
Type 2 C Simple Mixed Through-Hole & Surface Mount



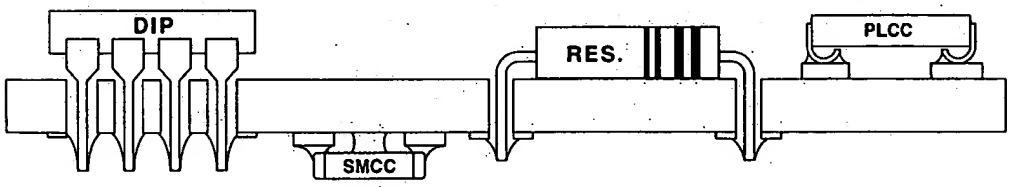
Type 1B Simple One Side Surface Mount



Type 2B Simple Surface Mount on Two Sides



Type 1C Simple Mixed Through-Hole & Surface Mount on One Side



Type 1A Simple Mixed Through-Hole & Surface Mount on Two Sides

Figure 3-5 Mixed Assemblies